Karunya University
(Karunya Institute of Technology and Sciences)
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End Semester Examinations - 2015-16 Even Semester - May 2016

14EC2014 Digital Signal Processing

Set B | **Time : 3 hrs**
Total Marks: 100

1. Using the radix-2 decimation-in-time FFT algorithm, compute the 8 point DFT of the sequence x (n) = {1/2,1/2,1/2,1/2,0,0,0,0}. Draw the flow graph and show all the intermediate results.

OR

2. An 8-point sequence is given by x (n) = {1,1,1,1,1,1,1,1}. Compute the 8 point decimation-in-frequency FFT of x (n). Draw the flow graph and tabulate the intermediate stage results.

3. Determine the output of a linear filter whose impulse response h(n)={1,-3,5}and input signal x(n)={-1,4,7,3,-2,9,10,12,-5,8}using overlap add method.

OR

4. a) Determine the output response y(n) if h(n)={1,1,1} and x(n)={1,2,3,1}by using

   (i) Linear convolution (ii) circular convolution. (14)

   b) Determine the DFT of the sequence (06)

$$x(n)=\begin{cases}1/4 \ , & for\ 0\le n\le 3\\ 0 & otherwise\end{cases}$$

5. Design a Butterworth digital IIR filter satisfying the following constraints

$$0.7\le\left|H(e^{j\omega})\right|\le 1 \qquad for\ 0\le\omega\le 0.2\pi$$
$$\left|H(e^{j\omega})\right|\le 0.3 \qquad for 0.6\pi\le\omega\le\pi$$

With T=1 sec apply impulse invariance method.

OR

6. Design a Chebyshev filter for the following specifications using bilinear transformation method.

$$0.707\le\left|H(e^{jw})\right|\le 1\ ;0\le w\le\frac{\pi}{2}$$
$$\left|H(e^{jw})\right|\le 0.2\ ;\ \frac{3\pi}{4}\le w\le\pi$$

7. Design an ideal lowpass filter with the following frequency response using a Hanning window for the length N=11. Also find H(z).

$$H_d(e^{j\omega})=\begin{cases}1 \ \ for & \frac{-\pi}{2}\le\omega\le\frac{\pi}{2}\\ 0 \ \ for & \frac{\pi}{2}\le|\omega|\le\ \pi\end{cases}$$

OR

8. Determine the filter coefficients h(n) obtained by frequency sampling for N = 7.

$$H_d(e^{j\omega}) = \begin{cases} e^{-j(N-1)\omega/2} & 0 \le |\omega| < \pi/2 \\ 0 & otherwise \end{cases}$$

9. a)Explain the zero input limit cycle in the in fixed-point realization of first order digital IIR filter y(n)=a y(n-1)+x(n). Assume x[n] and y[n-1] are implemented by 4 bit registers (including sign bit) & a=1/2. (14)

b)Write the computational steps to implement the basic LMS algorithm and also draw the flowchart. (06)

Wishing you All the Best
